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Housing the Poor. A Study of High Density Poor Environments

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Abstract: The need for housing is a basic need, especially following the growth of population and the migration from rural villages towards large cities. The formation of slums around all large cities is a global phenomenon. Starting from the definition of slums, an attempt is made to study several phenomena linked with the formation of poverty satellite settlements, from social causes to specific architecture typologies and economic structures. Slum architecture follows a set of specific and similar patterns. For the future development of cities and architecture, understanding the mechanisms that make slums work is crucial.
Keywords: slums, poverty, high-density, architecture, sustainability, future models.

1. INTRODUCTION

The housing crisis is growing deeper as the continuous growth of population in stressing out the constant earth surface and its resources that in their vast majority are limited or hardly renewable. The need for housing is a basic need, which in its elementary form is translated as need for spatial support and shelter, being a direct follow up of the population growth and of people's migration towards large cities.

Globalization, urbanization and other socio-political factors have also heightened the dynamic of the relationship between cities and their surrounding outer urban areas. Large cities work in the way that they concentrate, accelerate, and diversify social and economic activity [1]. Dramatic demographic changes affect cities around the globe, under the influence of the rapid urbanization phenomenon, caused by economic growth. In relation to rapid urbanization, more people are attracted to cities in a dynamic shift from rural to urban. Most of them leave behind an agricultural life just to start from scratch in an environment they are unfamiliar with.

Employment is one of the major factors in determining migration. Migration can be determined also by other factors, like natural disasters or violence due to human generated conflicts, including deportation. In the first case people choose to leave their initial location, but in the second case people are forced to leave due to circumstances, mostly against their will. The first group has a better position compared to the second one, leaving by plan while owning possessions and personal goods and being able to make minimal economic exchanges, while the second group generally leaves violently, unplanned and stripped of any possessions [2]. This study will focus on migration due to urbanization, which generates slums.

2. DEFINING THE SLUMS. DETERMINING CONDITIONS, TYPOLOGIES AND NUMBERS

Urbanization remains the biggest attractor of people's migration by choice, and causes the creation of slums. All large developing cities attract slums, as a natural and necessary part of the urbanization process. By attracting cheap labour that exceeds the possibility of the city to ensure housing in accordance to the needs of the newly arrived, overpopulation in poor peripheral areas is created. Most of the people that come to large cities in search for work are poor and cannot afford to pay rent. Therefore, living in slums becomes the norm for many, simply out of necessity and not by choice. According to current numbers, one in seven people live in squatter communities – illegally grouped communities or neighbourhoods on terrains on which they lack ownership. The act of squatting can be either linked to poverty and to basic deprivation, being also described as "third world squatting", or can be based on political grounds. Squatting due to poverty derives out of a conflict between power, property and urban development that creates the need for housing but fails to provide a solution. As a result, people are trying to solve the housing problem on their own, generating social and legal conflicts.

The definition of slums is complex, depending on a group of factors that point out the basic deprivations in the living conditions in poor neighbourhoods, according to UN-Habitat, the United Nations Human Settlements Programme. The main deprivations are: the nature of housing, not being permanent and durable, sufficient living space, easy access to safe water, access to adequate sanitation and the security of property. These deprivations are not homogeneous for all slums and do not necessarily manifest themselves simultaneously [3]. Overall, one in five slum dwellers suffers from at least three basic deprivations and is living in extreme poverty. Slums can generally be defined as invasions of public or private land with self-build shelters developed by

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poor groups; the groups of dwellings lack infrastructure and planning.

Among the best known squatting communities are those of the favellas in Rio de Janeiro, the jhopadpattis of Mumbai, Kibera in Kenya – one of the largest mud-hut neighborhoods in Sub-Sahara Africa or Makoko in Lagos. Those communities lack ownership in a legal sense, lack government and city services. Living conditions in all slums are very low, and basic urban services like water, sewers or electricity are missing. The main reason they exist and function is that they offer cheap housing and also ways to earn a minimal living, while the cost of housing here is much lower than in legal urban areas.

Although statistics show that the proportion of population living in slums all over the world is decreasing lately, at the same time the overall number of people living in slums is rising. According to UN Habitat, it is estimated that in 2015 the total population living in slums will reach 1,298,552,000 people, out of which 57,94 % will be located in Asia [4]. Currently, 90% of those informal settlements are located in developing nations, like India and Brazil, but in the same time they represent a global phenomenon [5].

In the case of some of the most over-populated cities of the world, like Delhi in India or Manila in Filipinas, the actual urban population density varies from 30,000 to 40,000 people per km2, while the population density in slums is more than 250,000 people per km2. The maximum density achieved today is in Mumbai, reaching 386,000 people per km2 in some areas [6].

3. ARCHITECTURE OF SLUMS. GENERATION, COMPOSITION AND FEATURES

The architecture of the slums is determined by local conditions and local materials, and can be therefore defined as vernacular architecture. Slum architecture itself doesn't follow any trend or architecture style and is solely the outcome of direct sheltering necessities. Still, this architecture manages to bear similar characteristics all over the world, being done in a similar fashion and having an easily recognisable image for everybody [2]. The pattern of land occupation, the size of the outer volume and the interior dimensions of a living cubicle are all derived from minimal living necessities. All those characteristics, as well as the similar general image of slum buildings lead the architecture of urban slums to become a global phenomenon, with slight regional differences given by site conditions. The main reason why an architectural phenomenon outside the boundaries of legitimate architecture manages to generate a global current is found in the constant similarity of the contexts of implementation – slums are almost organic growths generated in urban environments, inside urban landscapes, and have similar composition principles. The overall way of construction and composition is not planned, being random and lacking hierarchy. The relation between parts is chaotic, but the assembly take a precise account on all the characteristics of the natural or artificial terrain, onto which it moulds onto, as in the slums of Rio de Janeiro or Sao Paulo in Brazil.

Some common features of slum housing recognizable everywhere include: similar building indexes and similar densities; the minimal character of the volume, being a minor architecture build according to possibilities; similar sizing of the interior space generally defined as a unique multifunctional and fickle space in which the life of a whole family evolves; making use of simple volumes and construction techniques; very short construction time, compared to the period that other urban structures need to grow and develop, partially due to the simple building method that doesn't require long building processes and also due to the lack of planning phases prior to the beginning of the construction; the constant need of improvement and renewal due to the temporary character of the constructions.

As in the case of facts considered to define which developments do qualify as slums, where the deprivations must not all apply simultaneously in order for a slum to be valid, the same rule of manifestation can be applied in the case of the main architectural features that define slums. The main characteristics don't have to manifest themselves simultaneous in order to be recognized. Table 1 represents a chart study comparing the most common architectural features of several representative slums across the world, while the occupation patterns and urban grain for the same slums are depicted in Fig. 1.

LOCATION / FEATURES	Mumbai, India	Rio de Janeiro, Brazil	Macao, China	Makoko, Nigeria	Kibera, Kenia
units of similar size	■	■	■	■	□
sensitive to terrain features	■	■	■	■	■
temporary character	■	■□	□	■	■
multiple storeys (>1)	□	■	■	□	□
orthogonal ordering		□	■□	□	□

Table 1 – Main architectural features of different slums.

The houses build by the poor are the direct outcome of the opportunities, building skills and knowledge of the owners in relation to the location, to resources and to the economic status, because in most of the cases the houses are build by their owners alone or in cooperation with their neighbors. The former dwellers of the rural areas have enough vernacular construction knowledge due to the specific activities sustained in the rural environment, where they usually

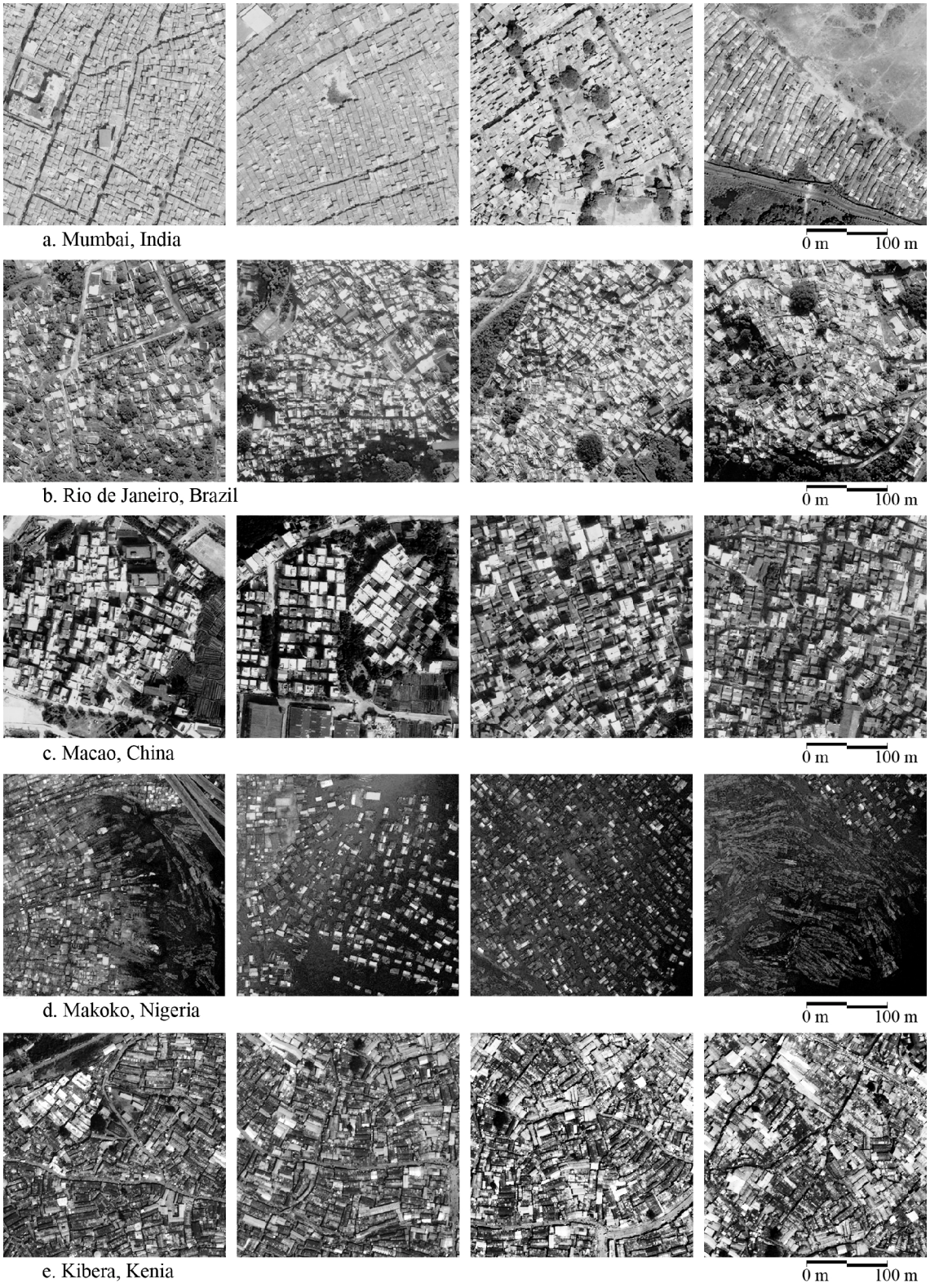

Figure 1. Comparative study of occupation patterns and urban grain.

built their homes by themselves or benefited of the support of the community and where grew their own food. The erection of dwellings resides a lot on the community spirit and on the help of the community. The materials used for buildings are generally scrap materials, recycled or recuperated materials, which directly influence the quality of housing.

Those dwellings are actually shelters, constructions of temporary character that need constant maintenance, refurbishment and re-construction. They generally offer a simple protective shell, which in most cases doesn't even guarantee the most basic protection for their inhabitants. Bad housing conditions are the main cause for physical

illnesses, due to the absence of minimal sanitation and poorly insulated construction elements, but they also draw other more subtle dangers, such as the lack of education due to lack of electricity, lack of security due to lack of construction sturdiness, but also risks of fire and burglary. This is also the main reason why slum communities are the most endangered group in case of natural disasters, like the case of earthquakes in the Chinese province of Sichuan in 2008 or Haiti in January 2010 [7]. It is obvious that a bad housing quality directly affects a large number of people, and therefore perpetuates poverty [8].

Sometimes a great effort is invested in preparations that precede construction, to provide a solid supporting ground as in the case of Makoko, one of the major slum cities, located in Lagos, Nigeria. The city itself is part land and part lagoon, and the effort to reclaim proper building terrain from the water is great. Specialized groups of workers have formed to do the land reclaiming, by filling out shallows by layering and compacting trash. Still, sturdier constructions are only generated where the local government policies accept the slums and do not fight to eradicate them [9]. This is the case of Favela Santa Marta in Rio de Janeiro, where the local municipality started to engage with the local community and where the local power company made a bargain with the community, as to install meters and to receive payment for the provided electricity. Otherwise, it makes no sense to invest labour and money into a building that might be demolished anytime in the near future, and therefore the slum remains primitive in its composition.

4. SUBTERRANEAN ECONOMIES, MARKETS AND EMPLOYMENT

Although the slums are located right on the edge highly developed urban areas, their inhabitants often remain inside the limit of the slums and are only active within them, remaining apparently unseen for the rest of the city. Major slums are partially or totally self-governed by persons within the group and develop specific economies in the form of light industries, commerce and services. All those activities manage to produce enough money for the inhabitants in order to ensure them a life from day to day.

Beyond the direct benefit brought to their dwellers, subterranean economies directly help the economy of the broader urban body of which they belong, even if this fact is often denied or passed over in silence by the official vision of the municipality. In relation to the developed city, the prices of products resulted from slum production are highly profitable, and the market of the slum is a fertile trade ground. Those two factors determine the commercial relations between the two areas to link directly and indirectly. In slums, street vendors and various non-licensed operators managed to generate sufficient jobs for all residents out of sheer necessity of survival, and the presence of 1.8 billion jobs in the informal economy cannot be easily ignored. Those small enterprises have proved to be competitive and in the global market economy. On the other hand, many major corporations have admitted the possibility to explore the power of unlicensed entrepreneurship, such as the case of the mobile telephone industry that uses the slum retail market [9].

Informal economy is characterized by a larger dynamic compared to its legal forms, strengthened by a great sustainability of specializations. Another feature that helps to the success of these businesses is the fact that they take place in urban areas, and due to the high density of slums, business activities cover a small area of land in relation to the city, so that there is no need for transport services towards users. It is much cheaper and easier to provide services and products in a small area, offering a service from a fixed location, or providing services that require minimal travel by primitive transportation means (rowing boat, bicycle, rickshaw or pedestrian) that do not consume fuels that might lead to increased costs.

Still, the paradox of this functional informal economy is that the poor earn exactly enough money to survive, but never enough to advance up the social leather.

5. SLUM QUALITIES, RESOURCES FOR THE GLOBAL FUTURE

Throughout history, most of the major cities have been built using poor populations that contributed in the construction itself and in strengthening the economy of the central urban core. In contemporary culture, poor satellite towns and slums were considered sources of conflict and negative areas compared to cities in development, but now their importance in the overall process of urban growth is being reviewed.

Many contemporary viewpoints consider the slums as a resource for the global future, by the force embedded in this dense structure of people, activities and relationships. The specific force of slums is based on the dense environment, on the social relations and the resilience of their inhabitants, strengthened by the age of the population, which is generally young. The entrepreneurial spirit of the inhabitants keeps the community alive through the economy and the constant housing rebuilding, while the social ties within the slums are very tight, based on relationships of caring, arising from the condition of poverty. Slums contain qualities often invoked by architects and urban planners as attracting the quality of an urban space: they are easy to navigate on foot, containing mixed functions obtained both by the practiced trade and through the multiple uses of housing, and have high density [10]. They encompass cosmopolitan features, being multicultural communities, multiracial, global and urban. Slums are in a continuous process of rewriting and transforming.

One of the most appreciated qualities of slums in this moment is their extremely low energy footprint and their ecological quality, despite low sanitary conditions. Although it seems rather hypocritical to appreciate a quality resulting partly from extreme poverty and partly due to the closed manner in which these communities work, in a world concerned with minimizing the energy footprint per capita it is

essentially to study the patterns that regulate this mechanism. The compactness of housing units in the settlement makes the slum itself an ecological model of maximum energy efficiency. However, an actual analysis of the energy consumption footprint of slum inhabitants has not yet been achieved, although at first glance they have the smallest energy footprint.

Another environmental quality of these communities is their extreme inclination towards recycling, which in most slums represents a way of life. Dharavi slum in Mumbai has 400 centres for waste collecting and 30.000 garbage pickers [6]. All materials that can be used for constructions are collected and recycled, and the job of collecting garbage for recycling purposes is an occupation that ensures survival.

Perhaps the greatest virtue of slums lies right within the qualities of the people that make up the community. Most people are originating from rural areas where they grew their own food and built their own homes, so that their knowledge in these areas is vital for surviving in minimum conditions. In addition, the resilience of people from rural areas to harsh conditions is increased and exercised, compared to people raised in urban areas, much less trained in the sense of surviving in minimum conditions and with limited resources available.

Among the specific spatial qualities that stand out are the opened private spaces, especially in warm climate environments, and the strong relationship with the exterior, their openness towards the public space and neighbourhood. Each one sees and is seen constantly, and this fact leads to strengthen the communitarian spirit and lowers crime rates. Slums manage to generate a continuous space of activities and social communication.

6. OPERATING WITH SLUMS. URBAN DEVELOPMENT AND ARCHITECTURE. CASE STUDIES

Concerning the way of operating with these urban growths, it is clear from past experience that denying or destroying them without following any coherent politics of compensation will not bring any positive outcome. Leading an official punitive policy by using force, unrelated to the reality of life in slums, is wrong. Collaboration between government, local municipality and slum communities is necessary. Those communities contain within them a huge social and economic power, managing to survive and resist to all forced attempts to remove them. Their power lies in their inhabitants, who possess the inventiveness and the will to make these communities to resist and function [9].

The solution that Steward Brand suggests in his article “How Slums can save the Planet” is the involvement of a new profession within the management of conflict areas, engaged and active, which is that of the urban ecologist, focusing on issues of contemporary urban life and strengthening the natural infrastructure of cities by operating on natural ecosystems such as rivers or shores of waters [6]. A possible solution in managing these growths is to regulate them partially, in a fragmentary and elastic manner, providing legal support and a minimal utility network that would work like a vague framework.

Regarding the architectural way of operating, taking over composition concepts of the slum’s structure could be the key to their positive future transformation, as well as in generating viable architectures for high density development areas. The slum composition and the structure of their assembly could be used as a framework model for future high density architectures. In the contemporary projects aimed at transforming or reforming impoverished environments, mainly two types of approaches to design are found: activist architects and volunteers engaged in social studies, in designing on-site and in the actual constructing of the houses for the poor, and architects generating abstract projects, concepts or studies of exploratory nature.

The first group has become an active presence after the 90’s, when the interest for the architecture of the poor and for emergency shelters in areas devastated by disasters became a current issue [11], and it presently implies social activism in all the aspects of marginal housing: housing for the poor, housing for conflict and war areas or for areas devastated by natural disasters. This group considers that in order to have positive results you must work closely and in a sensitive way with the community. It has been proven that to generate architecture from a computer in an office, independent from the real situation and without any communication with all those directly involved is an inefficient solution. The architects Franziska Orso and Ulrike Pitro belong to this group. They have participated in a housing project in Mpumalanga and Alexandra, in South Africa, and they believe that the main aim of slums interventions is to generate a flexible framework for the development of housing that allows inhabitants to express themselves freely, by being able to define and customize their homes [12]. A rigid architectural scheme presents a great risk of being rejected by the inhabitants due to its inflexibility to multiple uses.

The second group is heterogeneous, being composed equally of students, practitioners and academics, and is based on an analysis from above of the crisis situation of housing, generating a number of architecture ideas and prototypes that are partly utopian. The contained utopia brings high levels of innovation and new ways of looking at residential architecture in general, even when the solutions are highly conceptual. Many innovative schemes are generated in the international academic context and in concept competitions for young professionals, discussing various topics related to architecture such as ecology, waste recycling, sociology, while the proposals have a high degree of freshness, bringing a fresh look on architecture.

One of the main platforms for experimental architecture is the annual international contest E-Volo Skyscraper Competition, containing a lot of fresh ideas on reforming slums and high density environments. Such a project is Scrap Skyscraper of the group Projeto Colectivo (fig. 2), an entry in the competition of 2012 [13]. It imagines a structure made

out entirely from recycled materials and garbage in the city of San Paulo. Skyscrapers are located on the city's major rivers that are being used to transport waste. The base of the buildings contains waste recycling centres, while the upper levels are made up of modular housing units for the homeless. They have a fixed vertical circulation core, which together with the base generates the building structure. Upon this structure, housing units are freely added in time by its inhabitants, in an augmentative process, additionally supported by an exoskeleton-like structure which amplifies and expands in relation to the growth of the built body. By engaging residents in the process of recovery and recycling materials as well as in the process of repairing and construction, they are being offered a better quality of life and the opportunity for social involvement. This solution uses a specific growth pattern of the slums, presenting a building that can transform organically according to the number of its inhabitants and to their involvement, while in the same time it generates a highly technological architecture object.

In an opposite direction of approach is the proposal of Lebeus Woods, a very minimalist intervention (fig. 3). The architect imagined the insertion of a housing unit into the existing built fabric of the slum which can operate simultaneously as a place of work, cooking, meeting, rest and hygiene. It is a vaguely defined capsule, capable of re-configuring or allowing to be re-configured according to different usage patterns [14]. This capsule is a flexible concept, outside standardization and modulation, with the capacity to adjust individually according to any family structure or specific activities. It is an object that can transform organically in accordance with the needs of its inhabitants, while they are able to modify it in a dynamic manner. The capsule also has properties for energy renewal. The punctual insertion of multiple capsules within the slum tissue could activate the growth of a much healthier environment, from within. The architect stresses out the fact that this “transformative capsule”, in order to be functional in relation to its users, must serve their values, otherwise risking rejection.

Elements common to both directions are the retrieving of principles of composition from existing built structures of slums and the direct involvement of the community in the construction process. The community is in fact the main actor in shaping and determining the built environment, residents being actively involved in the process of defining the living spaces, exceeding the condition of ordinary beneficiaries of foreign goods and ideas brought from the outside [15].

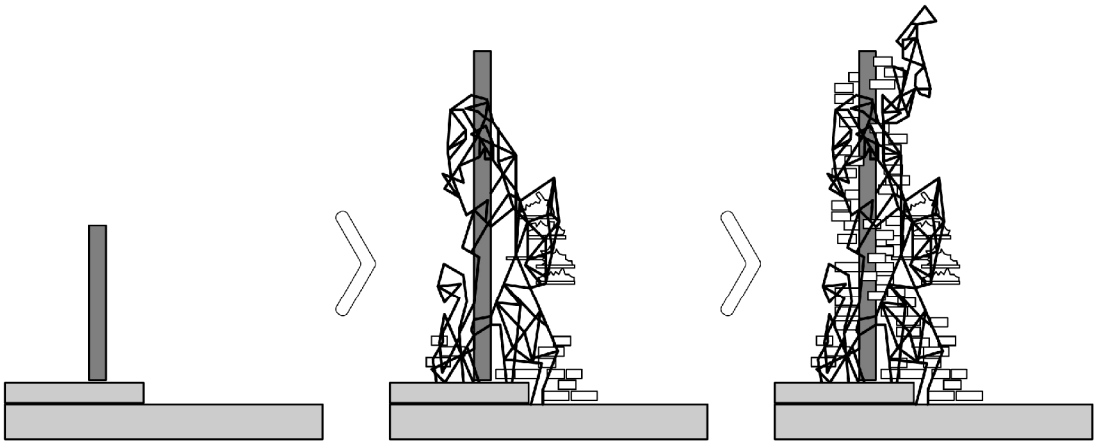

Figure 2. Study of the progressive structure of Scrap Skyscraper based on sketches by Projeto Colectivo.

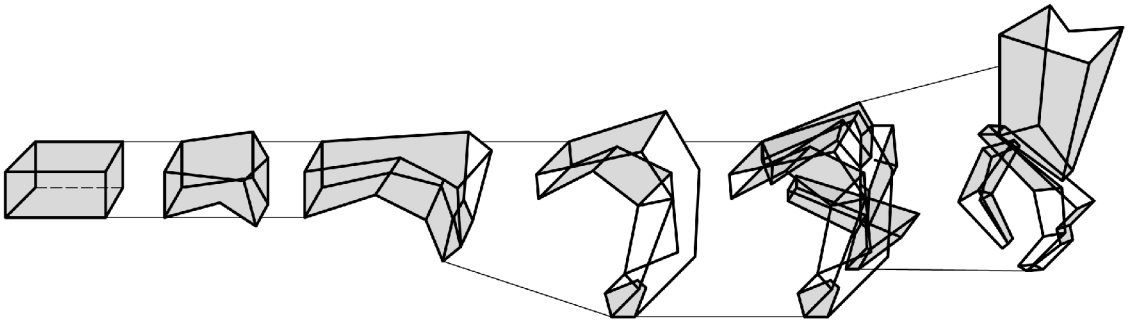

Figure 3. The progressive transformation of the housing capsule based on sketches by Lebeus Woods.

7. CONCLUSIONS FOR FUTURE DEVELOPMENTS

For the future development of cities and especially that of architecture, understanding the mechanisms that lead to the functioning of slums is essential. Therefore, the architecture of slums can serve as a model for improving the living conditions in slums, as well as for the future design of sustainable high density residential environments.

Minor architecture, of marginal areas and slums, represents s process of densification from within, made out of growths done by additive transformations, sensitive to context and to vicinities. Spontaneous architecture is an incremental process, and those developments are capable of constant adjustment to the physical and social immediate context, being much more adaptable to changes and therefore more resistant. Spontaneous growths, through the lack of regulation and design, include a greater capability for adapting. They are flexible and vibrant urban structures, which can be sustainable physically and socially in the long term.

The principles that can be extracted from the architecture of slums can theoretically generate sustainability for any pattern of high density architecture and the main concepts that can be extracted are: sustainability, complexity, diversity, adaptability, granulation and active engagement of the residents in the process of designing and building.

Figure 4 depicts a transformation study for the slums of Rio de Janeiro, Brazil, based on the existing pattern of the built structures of slums, used to generate a tall high density building. The constructive principles followed are that of adding and stacking up a same-sized unit, which for each level follows approximately the level curves of the terrain and the grain of the current slum structure. Even if density and height are different in the new object, the patterns are the same for both models.

Also, for generating viable high density architectures it is essential to give them the potential to cope with the increasing complexity of activities in the cities. The nature of contemporary urban life is very different from that of the traditional town, being more complex, heterogeneous, interrelated and dynamic, and in the case of high density, diversity is a specific feature.

Future high-density architectures, in order to be sustainable, will require a flexible framework, capable of self-adjustment and endowed with a responsive character to changes arising in time. It is proven that formal and functional over-determination applied to architecture can risk generating rigid and inflexible objects, incapable of adapting to shifting urban contexts. In contrast, architectures with flexible nature can support a variety of actions, also allowing the coexistence of heterogeneous expressions and easy adaptation to change of usage. Also, projects built, managed and adapted incrementally can accommodate a wide range of functions and users, and can adapt their form to the context, in comparison with the gigantic models that are abusive to the surrounding urban tissue [16].

One of the main challenges of the future is adaptation – to decreasing resources, to the socio-political and economical context, to climate changes. In this regard, correct future planning involves generating a complex agglomeration of multiple organisms, whose parts interact in rich and complex ways, in order to meet in synergy the city functions.

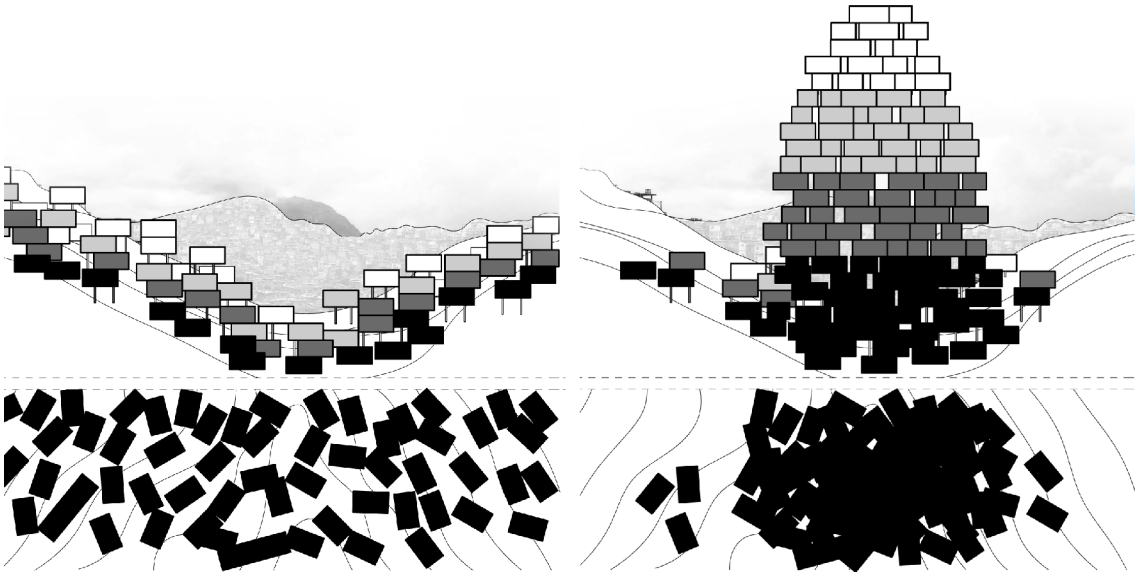

Figure 4. A transformation study of slums in Rio de Janeiro, using and converting existing slum patterns
4.a. Existing slum structure 4.b. Tall high density building following same patterns

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